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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/755,502	01/05/2001	Arthur H. Khu	X-779 US	5243
24309	7590	07/21/2006	EXAMINER	
XILINX, INC ATTN: LEGAL DEPARTMENT 2100 LOGIC DR SAN JOSE, CA 95124			YIGDALL, MICHAEL J	
			ART UNIT	PAPER NUMBER
			2192	

DATE MAILED: 07/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/755,502	KHU, ARTHUR H.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Michael J. Yigdall	2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 04 April 2006.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1,3-9,16-18,20,21 and 23-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1,3-9,16-18,20,21 and 23-26 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 14, 2006 has been entered. Claims 1, 3-9, 16-18, 20, 21 and 23-26 are pending.

### ***Response to Arguments***

2. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection, as set forth below with reference to Iwasawa. Applicant's amendment necessitated the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3-9, 16-18, 20, 21 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Enhanced Code Compression for Embedded RISC Processors" by Cooper et al. (art of record, "Cooper") in view of U.S. Patent No. 4,833,606 to Iwasawa et al. (now made of record, "Iwasawa") in view of U.S. Patent No. 5,606,698 to Powell (art of record, "Powell").

With respect to claim 1 (currently amended), Cooper discloses a method of optimizing computer program code where the computer program code includes a plurality of statements (see, for example, page 139, the abstract), the method comprising the steps of:

- (a) identifying a keyword statement, wherein the keyword statement includes a keyword and a data constant (see, for example, page 140, section 2.1, which shows identifying an instruction or keyword statement that includes both an opcode or keyword and constants);
- (b) sequentially locating each keyword statement in the program code (see, for example, page 140, section 2.1, which shows locating each equivalent instruction or keyword statement in the program code).

Although Cooper discloses converting each keyword statement and its constants to an indexed entry in a table or data array (see, for example, page 140, section 2.1), Cooper does not expressly disclose the step of:

- (c) converting in the program code, each data constant in each keyword statement to a data array reference, wherein each data array reference includes a data array name and an array index value, and the data array names in all converted keyword statements identify a single data array.

However, Iwasawa discloses converting data references in program code to data array references (see, for example, the abstract), wherein each data array reference includes a data array name and an array index value, and the data array names in all converted keyword statements identify a single data array (see, for example, FIGS. 2A and 7A, and column 4, lines 28-44, which shows a single data array with the data array name “TV1” and array index values ranging from 1 to N). This conversion prepares the program code for vectorization (see, for

example, column 3, lines 23-32), which improves execution efficiency (see, for example, column 1, lines 7-36).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to supplement the method of Cooper to convert, in the program code, each data constant in each keyword statement to a data array reference, wherein each data array reference includes a data array name and an array index value, and the data array names in all converted keyword statements identify a single data array, such as taught by Iwasawa, so as to prepare the program code for vectorization to improve its execution efficiency.

Cooper in view of Iwasawa further discloses:

- (d) searching the program code for the keyword statement after the conversion of each data constant to a data array reference (see, for example, page 140, section 2.1, which shows searching the program code for the keyword statement after the conversion);
- (e) determining, after searching the program code, if the keyword statement begins a repeating pattern of statements in the program code (see, for example, page 140, section 2, which shows finding repeated patterns of statements in the program code).

Although Cooper discloses replacing a repeated pattern of statements with a jump instruction or a procedure call equivalent to the repeated pattern (see, for example, page 141, section 3, and Figures 3 and 4), and although such a procedure call would operate as a program loop when consecutive repeated patterns are replaced and executed in succession, wherein the number of inserted call and return instructions (see, for example, page 141, section 3) would control the number of loop iterations, Cooper does not expressly disclose the step of:

(f) replacing the repeating pattern of statements with a program loop equivalent to the repeating pattern of statements.

However, Powell discloses replacing successive invocations of identical system functions with loop constructs (see, for example, column 5, lines 55-62), so as to minimize the amount of necessary program code, thereby reducing the amount of memory necessary to store the program code (see, for example, column 2, lines 45-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to supplement the method of Cooper to replace the repeated pattern of statements with an equivalent program loop, such as taught by Powell, so as to reduce the size of the program and the amount of memory needed to store it.

With respect to claim 3 (previously presented), the rejection of claim 1 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses the limitation wherein the converting includes assigning an array index value to the data array reference where each located keyword statement is assigned a next sequential value of the array index value (see, for example, Iwasawa, column 4, lines 28-44, which shows assigning an array index value I to the data array references successively or sequentially).

With respect to claim 4 (previously presented), the rejection of claim 3 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses the limitation wherein the determining step further includes:

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- (a) comparing data array references of two converted keyword statements from the program code (see, for example, Iwasawa, column 7, lines 48-56, which shows comparing data array references); and
- (b) determining if the array index values from the data array references match in size and sequential order (see, for example, Iwasawa, column 7, lines 4-16, which shows determining if the array index values match to indicate dependence).

With respect to claim 5 (previously presented), the rejection of claim 1 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses the limitation wherein the determining step includes:

- (a) determining a first pattern of statements in the program code beginning with a first converted keyword statement and ending with a statement preceding a second converted keyword statement that sequentially appears in the program code after the first converted keyword statement;
- (b) determining a second pattern of statements in the program code beginning with the second converted keyword statement and ending with a statement preceding a third converted keyword statement that sequentially appears in the program code after the second converted keyword statement; and
- (c) comparing the first pattern of statements to the second pattern of statements; and
- (d) setting the first pattern of statements as a repeating pattern if the first and second pattern of statements substantially match.

Cooper discloses the steps above in terms of finding repeated patterns in the program code, which are delineated by first, second, third, etc. instructions or keyword statements, by

comparing sets of instructions and determining whether the sets are equivalent (see, for example, page 140, sections 2 and 2.1, and see, for example, Figure 2, which show two matching patterns of statements or a repeated pattern of statements in the program code).

With respect to claim 6 (original), the rejection of claim 1 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses the limitation wherein the replacing step includes:

- (a) generating loop code for executing a loop within the source code at location of the repeating pattern of statements (see, for example, Powell, column 5, lines 55-62, which shows generating loop code for the repeated pattern of statements);
- (b) inserting one instance of the repeating pattern of statements within the loop code (see, for example, Powell, column 7, lines 33-38, which shows inserting an instance of the repeated pattern in the loop code); and
- (c) defining the loop code iterate a number of times equal to a number of instances of the repeating pattern (see, for example, Powell, column 6, lines 11-17, which shows defining the loop code to iterate the same number of times the repeated pattern is invoked).

With respect to claim 7 (original), the rejection of claim 1 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses the limitation wherein the keyword statement is identified from a predetermined keyword statement (see, for example, page 140, section 2.1, which shows that the instruction or keyword statement is identified based on the opcode predetermined from the instruction set).

With respect to claim 8 (original), the rejection of claim 1 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses the limitation wherein the keyword statement is identified from a selection made by a user (see, for example, page 140, section 2.1, which shows that the instruction or keyword statement is identified based on the constants selected by the user).

With respect to claim 9 (original), the rejection of claim 1 is incorporated, and Cooper in view of Iwasawa in view of Powell further discloses identifying a plurality of keyword statements and repeating the method for optimizing for each of the plurality keyword statements (see, for example, page 140, sections 2 and 2.1, which shows identifying each instruction or keyword statement and finding all of the repeats in the program).

With respect to claim 16 (currently amended) and claims 17, 18 and 20 (original), the limitations recited in the claims are analogous to those of claims 1, 5 and 6 (see the rejection of claims 1, 5 and 6 above).

With respect to claims 21 (currently amended) and claims 23, 24 and 25 (previously presented), the limitations recited in the claims are analogous to those of claims 1, 3, 5 and 6 (see the rejection of claims 1, 3, 5 and 6 above).

With respect to claim 26 (currently amended), the limitations recited in the claim are analogous to those of claims 1, 3, 5 and 6 (see the rejection of claims 1, 3, 5 and 6 above).

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***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Yigdall whose telephone number is (571) 272-3707. The examiner can normally be reached on Monday through Friday from 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MY

Michael J. Yigdall  
Examiner  
Art Unit 2192

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SUPERVISORY PATENT EXAMINER